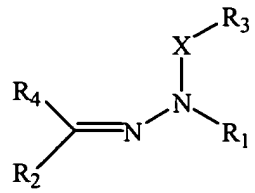
CLAIMS

What is claimed is:

1. An organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

(a) a charge transport compound having the formula



R_1 is an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group;

R_2 comprises an (N,N-disubstituted)arylamine group;

R_3 comprises an epoxy group;

R_4 is H, an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group; and

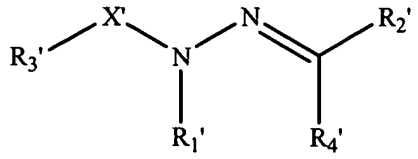
X is a first linking group; and

(b) a charge generating compound.

2. An organophotoreceptor according to claim 1 wherein the (N,N-disubstituted)arylamine group is selected from the group consisting of a p-(N,N-disubstituted)aryl amine group, a carbazole, and a julolidine group.

3. An organophotoreceptor according to claim 1 wherein X is a $-(CH_2)_m-$ group, where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7, or a CR_8R_9 group where R_6, R_7, R_8, and R_9 are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

4. An organophotoreceptor according to claim 1 wherein R_2 has the formula



where R_1' is an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group;

R_2' is selected from the group consisting of a carbazole group or a p-(N,N-disubstituted)arylamine group;

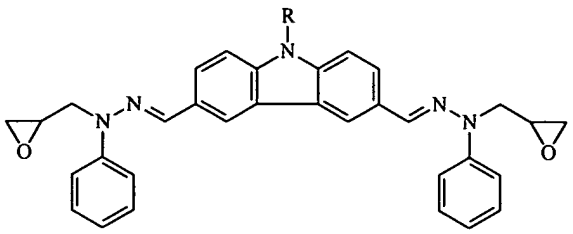
R_3' comprises an epoxy, a hydroxyl, a thiol, a carboxyl or an amine group;

R_4' is H, an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group; and

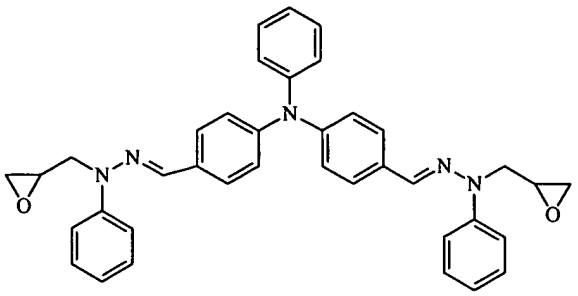
X' is a second linking group.

5. An organophotoreceptor according to claim 4 wherein X' is a $-(CH_2)_n-$ group, where n is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7, or a CR_8R_9 group where R_6, R_7, R_8, and R_9 are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

6. An organophotoreceptor according to claim 5 wherein the charge transport compound is selected from the group consisting of:



where R is hydrogen, an alkyl group, an aromatic group, or a heterocyclic group, and



7. An organophotoreceptor according to claim 1 further comprising an electron transport compound.

8. An organophotoreceptor according to claim 1 wherein the organophotoreceptor is in the form of a drum or a belt.

9. An organophotoreceptor according to claim 1 comprising:

(a) a charge transport layer comprising the charge transport compound and a polymeric binder; and

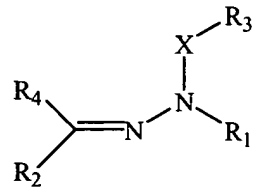
(b) a charge generating layer comprising the charge generating compound and a polymeric binder.

10. An electrophotographic imaging apparatus comprising:

(a) a light imaging component; and

(b) an organophotoreceptor oriented to receive light from the light imaging component, the organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

(i) a charge transport compound having the formula



R_1 is an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group;

R_2 comprises an (N,N-disubstituted)arylamine group;

R_3 comprises an epoxy group;

R_4 is H, an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group; and

X is a first linking group; and

(ii) a charge generating compound.

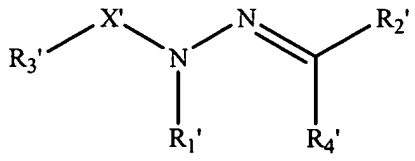
11. An electrophotographic imaging apparatus of claim 10 wherein the (N,N-disubstituted)arylamine group is selected from the group consisting of a p-(N,N-disubstituted)aryl amine group, a carbazole, and a julolidine group.

12. An electrophotographic imaging apparatus of claim 10 wherein X is a $-(CH_2)_m-$ group, where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7, or a CR_8R_9 group where R_6, R_7, R_8, and R_9 are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

13.An electrophotographic imaging apparatus of claim 10 further comprising a toner dispenser.

14. An electrophotographic imaging apparatus of claim 10 wherein the organophotoreceptor further comprises an electron transport compound.

15. An electrophotographic imaging apparatus of claim 10 wherein R_2 has the formula



where R_1' is an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group;

R_2' is selected from the group consisting of a carbazole group or a p-(N,N-disubstituted)arylamine group;

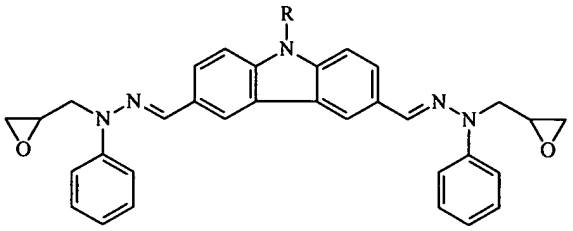
R_3' comprises an epoxy group, a hydroxyl group, a thiol group, a carboxyl group, or an amine group;

R_4' is H, an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group; and

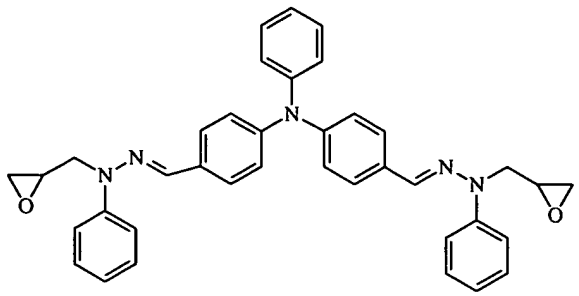
X' is a second linking group.

16. An electrophotographic imaging apparatus of claim 15 wherein X' is a $-(CH_2)_n-$ group, where n is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7, or a CR_8R_9 group where R_6, R_7, R_8, and R_9 are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

17. An electrophotographic imaging apparatus of claim 16 wherein the charge transport compound is selected from the group consisting of:



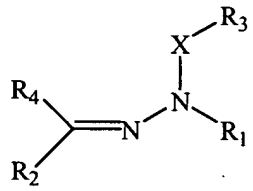
where R is hydrogen, an alkyl group, an aromatic group, or a heterocyclic group, and



18. An electrophotographic imaging process comprising:

(a) applying an electrical charge to a surface of an organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

(i) a charge transport compound having the formula



R_1 is an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group;

R_2 comprises an (N,N-disubstituted)arylamine group;

R_3 comprises an epoxy group;

R_4 is H, an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group; and

X is a first linking group; and

(ii) a charge generating compound;

(b) imagewise exposing the surface of the organophotoreceptor to radiation to dissipate charge in selected areas and thereby form a pattern of charged and uncharged areas on the surface;

(c) contacting the surface with a toner to create a toned image; and

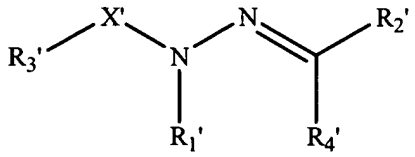
(d) transferring the toned image to a substrate.

19. An electrophotographic imaging process of claim 18 wherein the (N,N-disubstituted)arylamine group is selected from the group consisting of a p-(N,N-disubstituted)aryl amine group, a carbazole, and a julolidine group.

20. An electrophotographic imaging process of claim 18 wherein X is a $-(CH_2)_m-$ group, where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7, or a CR_8R_9 group where R_6, R_7, R_8, and R_9 are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

21. An electrophotographic imaging process of claim 18 wherein the organophotoreceptor further comprises an electron transport compound.

22. An electrophotographic imaging process of claim 18 wherein R_2 has the formula



where R_1' is an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group;

R_2' is selected from the group consisting of a carbazole group or a p-(N,N-disubstituted)arylamine group;

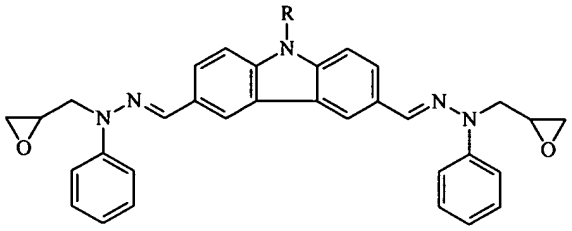
R_3' comprises an epoxy group, a hydroxyl group, a thiol group, a carboxyl group, or an amine group;

R_4' is H, an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group; and

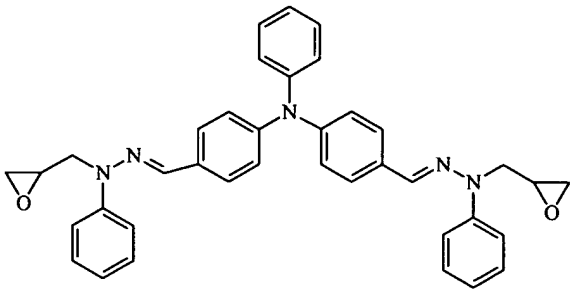
X' is a second linking group.

23. An organophotoreceptor according to claim 22 wherein X' is a $-(CH_2)_n-$ group, where n is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7, or a CR_8R_9 group where R_6, R_7, R_8, and R_9 are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

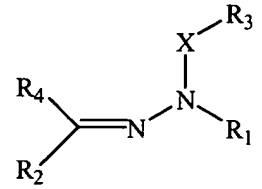
24. An electrophotographic imaging process of claim 23 wherein the charge transport compound is selected from the group consisting of:



where R is hydrogen, an alkyl group, an aromatic group, or a heterocyclic group, and



25. A charge transport compound having the formula



where R_1 is an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group;

R_2 comprises an (N,N-disubstituted)arylamine group;

R_3 comprises an epoxy group;

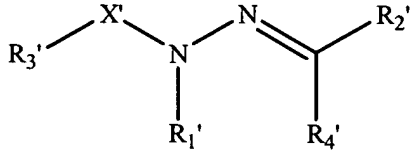
R_4 is H, an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group; and

X is a first linking group.

26. A charge transport compound of claim 25 wherein the (N,N-disubstituted) arylamine group is selected from the group consisting of a p-(N,N-disubstituted)aryl amine group, a carbazole, and a julolidine group.

27. An electrophotographic imaging process of claim 25 wherein X is a $-(CH_2)_m-$ group, where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7, or a CR_8R_9 group where R_6, R_7, R_8, and R_9 are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

28. A charge transport compound of claim 25 wherein R_2 has the formula



where R_1' is an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group;

R_2' is selected from the group consisting of a carbazole group or a p-(N,N-disubstituted)arylamine group;

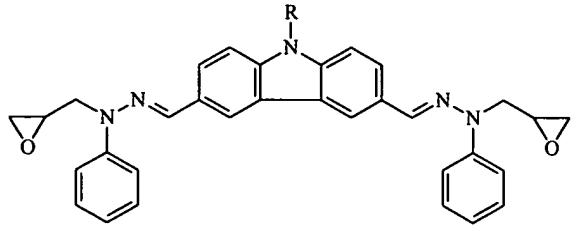
R_3' comprises an epoxy group, a hydroxyl group, a thiol group, a carboxyl group, or an amine group;

R_4' is H, an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group; and

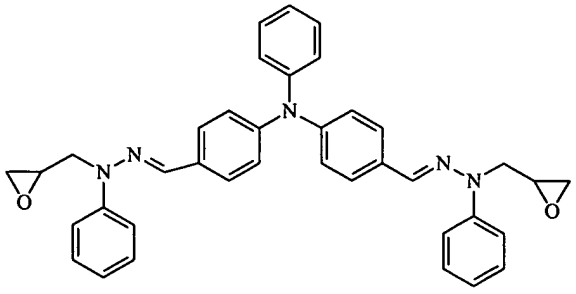
X' is a second linking group.

29. A charge transport compound of claim 28 wherein X' is a $-(CH_2)_n-$ group, where n is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7, or a CR_8R_9 group where R_6, R_7, R_8, and R_9 are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

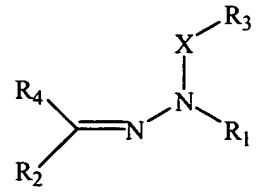
30. A charge transport compound of claim 29 wherein the charge transport compound is selected from the group consisting of:



where R is hydrogen, an alkyl group, an aromatic group, or a heterocyclic group, and



31. A charge transport composition prepared by the reaction of at least a reactive functionality of a functional binder with at least an epoxy ring in a compound having the formula



where R_1 is an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group;

R_2 comprises an (N,N-disubstituted)arylamine group;

R_3 comprises an epoxy group;

R_4 is H, an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group; and

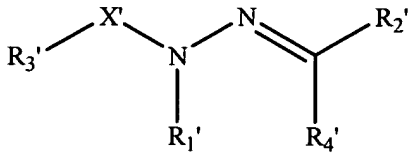
X is a first linking group.

32. A charge transport composition of claim 31 wherein the reactive functionality is selected from the group consisting of hydroxyl, thiol, carboxyl, and an amino group.

33. A charge transport composition of claim 31 wherein the (N,N-disubstituted)arylamine group is selected from the group consisting of a p-(N,N-disubstituted)aryl amine group, a carbazole, and a julolidine group.

34. A charge transport composition of claim 31 wherein X is a $-(CH_2)_m-$ group, where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7, or a CR_8R_9 group where R_6, R_7, R_8, and R_9 are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

35. A charge transport composition of claim 31 wherein R_2 has the formula



where R_1' is an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group;

R_2' is selected from the group consisting of a carbazole group or a p-(N,N-disubstituted)arylamine group;

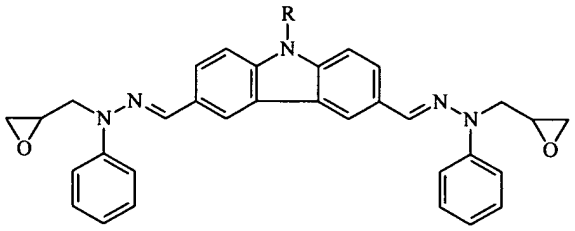
R_3' comprises an epoxy group, a hydroxyl group, a thiol group, a carboxyl group, or an amine group;

R_4' is H, an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group; and

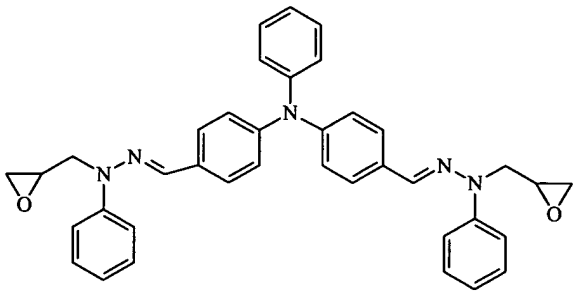
X' is a second linking group.

36. A charge transport composition of claim 35 wherein X' is a $-(CH_2)_n-$ group, where n is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7, or a CR_8R_9 group where R_6, R_7, R_8, and R_9 are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

37. A charge transport composition of claim 36 wherein the charge transport compound is selected from the group consisting of:

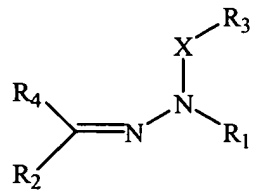


where R is hydrogen, an alkyl group, an aromatic group, or a heterocyclic group, and



38. An organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

(a) a polymeric charge transport compound prepared by the reaction of at least a reactive functionality of a functional binder with at least an epoxy ring in a compound having the formula



R_1 is an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group;

R_2 comprises an (N,N-disubstituted)arylamine group;

R_3 comprises an epoxy group;

R_4 is H, an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group; and

X is a first linking group; and

(b) a charge generating compound.

39. An organophotoreceptor according to claim 38 wherein the photoconductive element further comprises an electron transport compound.

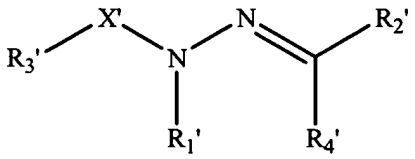
40. An organophotoreceptor according to claim 38 wherein the reactive functionality of the binder is selected from the group consisting of hydroxyl, carboxyl group, thiol, and an amino group.

41. An organophotoreceptor according to claim 38 wherein the (N,N-disubstituted)arylamine group is selected from the group consisting of a p-(N,N-disubstituted)aryl amine group, a carbazole, and a julolidine group.

42. An organophotoreceptor according to claim 38 wherein X is a $-(CH_2)_m-$ group, where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, P, C=O, O=S=O, a

heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7, or a CR_8R_9 group where R_6, R_7, R_8, and R_9 are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

43. An organophotoreceptor according to claim 38 wherein R_2 has the formula



where R_1' is an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group;

R_2' is selected from the group consisting of a carbazole group or a p-(N,N-disubstituted)arylamine group;

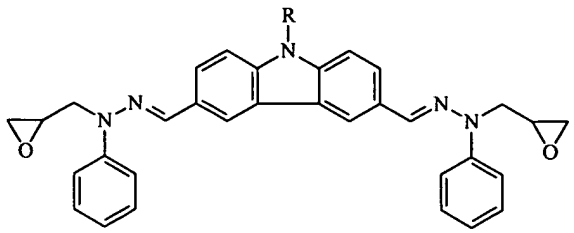
R_3' comprises an epoxy group, a hydroxyl group, a thiol group, a carboxyl group, or an amine group;

R_4' is H, an aromatic group, an alkyl group, an alkenyl group, or a heterocyclic group; and

X' is a second linking group.

44. An organophotoreceptor according to claim 43 wherein X' is a $-(CH_2)_n-$ group, where n is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, P, C=O, O=S=O, a heterocyclic group, an aromatic group, urethane, urea, an ester group, an NR_6 group, a CR_7, or a CR_8R_9 group where R_6, R_7, R_8, and R_9 are, each independently, a bond, H, hydroxyl, thiol, carboxyl, an amino group, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

45. An organophotoreceptor according to claim 44 wherein the charge transport compound is selected from the group consisting of:



where R is hydrogen, an alkyl group, an aromatic group, or a heterocyclic group, and